

WHAT I CLAIM IS :

1. Process for the manufacture of a work hardened product made of a high mechanical strength Al-Zn-Mg-Cu aluminium alloy comprising :

- casting an ingot made of an alloy with  
5 composition (% by weight) Zn = 7.0 - 11.0, Mg = 1.8 - 3.0; Cu = 1.2 - 2.6 at least one of the elements Mn (0.05 - 0.4), Cr (0.05 - 0.3), Zr (0.05 - 0.20), Hf (0.05 - 0.5), V (0.05 - 0.3), Ti (0.01 - 0.2) and Sc (0.05 - 0.3), the remainder being made of aluminium and  
10 inevitable impurities,
  - possibly homogenisation of said ingot,
  - hot transformation of said ingot by rolling, extrusion or forging,
  - solution heat treatment and quenching of the  
15 product obtained,
  - possibly controlled stretching with a permanent set between 1 and 5%,
  - annealing of the product at a temperature and with a duration such that the product reaches the  
20 maximum compression yield strength in the L direction.

2. Process according to claim 1, wherein the magnesium content of the alloy is between 1.8 and 2.4%.

3. Process according to claim 1, wherein the copper content of the alloy is between 1.6 and 2.2%.

25 4. Process according to claim 1, wherein the magnesium content of the alloy is between 1.8 and 2.4%, and the copper content is between 1.6 and 2.2%.

5. Process according to claim 1, wherein the alloy is 7349 or 7449.

30 6. Process according to claim 1, wherein the alloy is 7055.

7. Process for the manufacture of a work hardened product made of a high mechanical strength Al-Zn-Mg-Cu aluminium alloy comprising :

- casting an ingot made of an alloy with  
5 composition (% by weight) Zn = 7.0 - 11.0, Mg = 1.8 - 3.0, Cu = 1.2 - 2.6 at least one of the elements Mn (0.05 - 0.4), Cr (0.05 - 0.3), Zr (0.05 - 0.20), Hf (0.05 - 0.5), V (0.05 - 0.3), Ti (0.01 - 0.2) and Sc (0.05 - 0.3), the remainder being made of aluminium and  
10 inevitable impurities,
  - possibly homogenisation of said ingot,
  - hot transformation of said ingot by rolling, extrusion or forging,
  - dissolution and quenching of the resulting  
15 product,
    - possibly controlled stretching with a permanent set between 1 and 5%,
    - single step annealing at a temperature and with a duration included within the parallelogram AEFG,  
20 in which the vertices in the temperature-duration diagram have the following coordinates:

A: 120°C - 100 h E: 145°C - 5 h F: 150°C - 40 h G: 120°C - 700 h.

8. Process according to claim 7, wherein the  
25 annealing is a single step annealing at a temperature and with a duration within the parallelogram ABCD, in which the vertices in the temperature-duration diagram have the following coordinates:

A: 120°C - 100 h B: 145°C - 9 h C: 145°C -  
30 22 h D: 120°C - 230 h.

9. Process according to claim 1, wherein the equivalent annealing time at 120°C is between 100 and 250 h.

10. Process according to claim 1, wherein the equivalent annealing time at 120°C is 50 to 200 h longer than the time corresponding to temper T651.

11. Process according to claim 1, wherein said  
5 annealing is a two-step annealing comprising

a first step at a temperature between 80°C and 120°C, and

a second step at a temperature between 120°C and 160°C,

10 and wherein said equivalent annealing time at 120°C is between 100 and 250 h.

12. Process according to claim 1, wherein said annealing is a three-step annealing comprising

15 a first step at a temperature between 80°C and 120°C,

a second step at a temperature between 120°C and 160°C, and

a third step at a lower temperature than the second step and between 100°C and 140°C,

20 and wherein the equivalent annealing time at 120°C is between 100 and 250 h.

13. Structural element for mechanical construction and particularly aeronautical construction, manufactured from at least one rolled, extruded or  
25 forged product obtained by the process according to claim 1.

14. Structural element for mechanical construction and particularly aeronautical construction, manufactured from at least one rolled, extruded or  
30 forged product obtained by the process according to claim 2.

15. Structural element for mechanical construction and particularly aeronautical construction,

manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 3.

16. Structural element for mechanical construction  
5 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 4.

17. Structural element for mechanical construction  
10 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 5.

18. Structural element for mechanical construction  
15 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 6.

19. Structural element for mechanical construction  
20 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 7.

20. Structural element for mechanical construction  
25 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 8.

21. Structural element for mechanical construction  
30 and particularly aeronautical construction, manufactured from at least one rolled, extruded or forged product obtained by the process according to claim 9.

22. Structural element for mechanical construction  
and particularly aeronautical construction,  
manufactured from at least one rolled, extruded or  
forged product obtained by the process according to  
5 claim 10.

23. Structural element for mechanical construction  
and particularly aeronautical construction,  
manufactured from at least one rolled, extruded or  
forged product obtained by the process according to  
10 claim 11.

24. Structural element for mechanical construction  
and particularly aeronautical construction,  
manufactured from at least one rolled, extruded or  
forged product obtained by the process according to  
15 claim 12.